
Factors Affecting Meat Preferences Among American Consumers

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This study analyzed socioeconomic and nutritional factors affecting consumers' preferences for meatless meals and, specifically, meals with less red meat. Consumers' preferences were influenced by geographical location, racial and ethnic background, family composition, and household income. Although females were not statistically different from males in their preference for red meat, they generally preferred more meatless meals. Similarly, older respondents preferred more meatless meals and less red meat than did younger respondents. Meat was less preferred, as well, among American households in the highest income group. Advanced educational level of the respondents positively influenced the preference for meatless meals and meals with less red meat, and nutritional concerns among consumers also had a significant influence. Notably, compared with concerns for vitamins and minerals, concerns for cholesterol, fat, and sugar had a stronger effect on the preference for less red meat. Data such as those presented here can provide useful descriptions of the distribution of health-influencing behavior in our population.

Americans are consuming less red meat such as beef and more non-red meats such as poultry. In 1999 the per capita consumption of red meat was 117.7 pounds, an 11-percent drop since 1970 (U.S. Department of Agriculture [USDA], 2001a; USDA, 2001b). Poultry consumption, however, increased 102 percent during the same period (up to 68.3 pounds per person). In general, trends in consumption of animal products during the last 30 years involve more use of poultry, fish, lowfat milk, yogurt, and cheese and less use of red meat, whole milk, eggs, butter, and lard (USDA, 2001a). Although the decrease in the consumption of red meat has been compensated by an increase in the consumption of poultry to a certain degree, overall consumption of red meat has declined. Price, income, taste, and preferences are the key variables affecting the levels of meat consumption (Putnam & Gerrior, 1997).

Differences in retail price between beef and poultry may explain some of the decline in the consumption of red meat. For example, per pound prices of retail beef and poultry have remained at an average of \$3.70 and \$1.50, respectively (Bureau of Labor Statistics, 2001). Changes in income have relatively little or even a negative effect on the demand for red meat. For example, a report on food spending in American households in 1997-98 revealed that higher income groups, compared with the middle-income groups, decreased their total spending on beef (Blisard, 2001).

Besides relative prices and income, many other factors played key roles in changing the demand for red meat. According to a report by the U.S. Department of Agriculture's (USDA) Economic Research Service (ERS) (Putnam & Allshouse, 2001), consumer concern about cholesterol and saturated fat, inconsistent quality, and lack of

convenience in preparation are associated with the negative trend in beef demand. Increasingly, associations between consumption of red meat and the onset of chronic disease have been reported. Examples include links between (1) metastatic prostate cancer and intakes of red meat and dairy products (Michaud et al., 2001) and (2) colon and other types of cancer and high consumption of red meat combined with low intakes of dietary fiber, fruits, and vegetables (Law, 2000).

Additional research has shown that people reduce their risk for colon cancer when they substituted lowfat dairy products for high-fat versions, margarine for butter, poultry for red meat, and whole grains for refined grains (Slattery, Boucher, Caan, Potter, & Ma, 1998). These findings exemplify the enormous body of literature linking patterns of overall dietary intake with increased risk for cancer and other chronic diseases.

Specific dietary patterns that begin during childhood—such as the consumption of high-fat dairy products and red meats—are likely to increase age-specific rates of cancer and other diseases in adult life; however, the risk may be reversed with later dietary change. For example, a reverse in childhood dietary patterns is demonstrated by more younger Americans becoming vegetarians. About 15 percent of the 15 million U.S. college students eat vegetarian meals during a typical day (Walker, 1995). In a similar study of 158 British undergraduate students, more females than males had avoided red meat. The main reason given was related to concerns for health and sensory factors (Santos & Booth, 1996).

Our study analyzed socioeconomic and nutritional factors affecting consumers' preferences for meatless meals and,

Table 1. Change in consumption of meatless meals and red meats

Response	"You are eating more meatless meals than you used to"	"You are eating less beef, pork, or lamb than you used to"
	<i>Percent</i>	
Strongly disagree	34.97	38.52
Somewhat disagree	19.57	22.30
Neither agree nor disagree	7.84	9.23
Somewhat agree	15.36	11.36
Strongly agree	22.26	18.59

n = 2,880.

specifically, meals with less red meat. Nutritional concerns related to meat were examined. A regression analysis was performed to identify statistically significant socioeconomic and demographic characteristics, as well as nutritional concerns influencing consumer preference.

Methods

Data and Sample

The data set used in this study was part of a nationwide telephone survey of 2,880 U.S. households conducted by the Gallup Organization in 1997 for the National Peanut Association (National Peanut Council, 1997). The survey used a probability sampling method and included adults only. Gallup used a multiple-call-back method to eliminate bias in favor of those easy to reach by telephone. A 95-percent confidence interval revealed a maximum expected error range from the sample at ± 3.1 percent.

Survey questionnaires included consumers' stated changes in meat consumption (if any), as well as nutritional concerns while selecting foods. Four market regions (West, Midwest, Northeast, and South) were identified, and these divisions were consistent with the designations of

geographical regions by the U.S. Bureau of the Census. Demographic sample means compared well with population averages. For example, 85 percent of the U.S. population is White; 51 percent is female. The sample population was 84 percent White and 57 percent female. The regional distributions of the sample and the U.S. population were nearly identical.

Variables

The dependent variables were developed from consumers' stated changes in meat consumption based on their responses to a 5-point scale: strongly disagree, somewhat disagree, neither agree nor disagree, somewhat agree, or strongly agree. The change in overall meat consumption was measured with the statement: "You are eating more meatless meals than you used to." The change in the consumption of red meat was measured with the statement: "You are eating less beef, pork, or lamb than you used to." Although most of the respondents either strongly disagreed or somewhat disagreed that they were eating more meatless meals or less red meat, more than 38 and 30 percent somewhat agreed or strongly agreed that they were eating more meatless meals and less red meat, respectively (table 1). These percentages represent an important change in the preference

for meat, particularly red meat, considering the large percentage of respondents who were eating meat and dairy products. Gallup poll data showed that 90 percent of the respondents normally consumed red meat, 93 percent consumed fish and poultry, and 94 percent consumed dairy products (National Peanut Council, 1997).

Geographic region, household income, race, gender, marital status, household type, education, and age of the respondents were the demographic variables used in the regression models (table 2). About one-third (33 percent) of the respondents lived in the South, four of five (84 percent) were White, and more than half (51 percent) were women. Over half were married (56 percent) and resided in households with children (53 percent). These respondents, on average, had attended at least some college, were 45 years old, and had a gross annual household income just under \$40,000.

Respondents were asked the following nutrition-related question: "When you choose the foods you eat, please tell me how frequently you consider the following issues, using a 10-point scale, where 10 means you consider nearly all the time (NAT), and 1 means you almost never (AN) consider it." The nutrition issues included cholesterol, fat, vitamins and minerals, and sugar. As expected, mean responses were generally neutral: On average, households tended to consider both desirable (vitamins and minerals) and undesirable (cholesterol, fat, and sugars) nutrition factors "sometimes" when making food-purchase decisions. However, the responses varied considerably.

Empirical Model

An ordered probit regression model was used because the preference variable was measured with a scale that allowed the outcomes to be ranked.

Table 2. Socioeconomic status and nutrition concerns when selecting food items

Variables	
	<i>Percent</i>
Geographic region	
Northeast	19.7
South	33.7
Midwest ¹	25.5
West	21.1
Race	
White	83.6
African American	7.4
Other ¹	9.0
Gender	
Men ¹	43.1
Women	56.9
Marital status	
Married	55.5
Unmarried ¹	44.5
Household type	
Household with children	37.5
Household without children ¹	62.5
Education	
No college ¹	37.9
Some college or higher	62.1
	<i>Mean</i>
Age	45.0
Household income	\$39,900
Nutrition concerns²	
Cholesterol level in food ³	5.6
Amount of fat ³	6.7
Vitamins and minerals ³	5.0
Sugar ³	5.1

¹Reference group in the regression model; other consists of Asian Americans, Hispanics, and Latin Americans.

²Scores ranged from 1 to 10, where 10 = very concerned.

³Coefficient of variation: cholesterol, 60.23; fat, 47.59; vitamins and minerals, 60.58; and sugar, 61.33.

n = 2,880.

In our study, women respondents were not statistically different from their male counterparts about their preference for red meat, although they preferred more meatless meals.

The empirical model is defined as

$$Y_t^* = \beta' X_t + \epsilon_t$$

where Y_t^* is an unobserved preference for meat; β is the vector of unknown parameters; X_t is a vector of four nutritional concern variables and sociodemographic variables hypothesized to affect the overall preference for meat and red meat; and ϵ_t is the independently and identically normally distributed error term. While Y_t^* is unobserved, respondents actually report preference by selecting one of the five categories (Y_t) representing consumers' like or dislike of meat in general and red meat in particular. Values for Y_t are 1 through 5, where 1 represents strongly disagree and 5 represents strongly agree to the statements: "You are eating more meatless meals than you used to," and "You are eating less beef, pork, or lamb than you used to." The unknown parameter vector in the empirical model, β , was estimated by using LIMDEP software (Greene, 1995).

The results of ordered probit models were interpreted by using the partial change or marginal effects on the probability of ordinal outcome. In doing so, the independent variables—other than the one being examined—were held constant at their mean values.

Results

Results from the ordered probit regression models for consumer preference for meatless meals and less red meat are reported in table 3. In addition, regression models were used to determine the marginal effects of the independent variables on consumers' preferences for meatless meals and less red meat (tables 4 and 5). The chi-square statistics for both models rejected (at the 0.01 level) the null hypothesis that all parameters were

Table 3. Consumer preference for meatless meals: Results of ordered probit models

Variables	Prefer more meatless meals		Prefer less red meat	
	Coefficient	Standard error	Coefficient	Standard error
Constant	-0.2840*	0.1749	-0.4243*	0.1420
Northeast	0.1350*	0.0824	0.2269*	0.0683
South	-0.0363	0.0727	0.1092*	0.0588
West	0.1396*	0.0820	0.3007*	0.0674
White	-0.0198	0.1175	0.0031	0.0880
African American	-0.0221	0.1515	0.2071*	0.1197
Women	0.3374*	0.0611	0.2786	0.0481
Married	-0.1557*	0.0643	-0.0472*	0.0520
Households with children	-0.2442*	0.0677	-0.1612*	0.0524
Some college or higher	0.1762*	0.0626	0.1528*	0.0506
Household income	0.0044*	0.0016	0.0027*	0.0013
Age	0.0070*	0.0021	0.0093*	0.0018
Cholesterol level in food	0.0315*	0.0106	0.0312*	0.0088
Amount of fat	0.0244*	0.0111	0.0240*	0.0093
Vitamins and minerals	0.0227*	0.0107	0.0058	0.0085
Sugar	0.0322*	0.0106	0.0231*	0.0087
μ (Threshold parameter 1)	0.5566*	0.0393	0.3680*	0.0239
μ (Threshold parameter 2)	0.7907*	0.0501	0.6102*	0.0304
μ (Threshold parameter 3)	1.4312*	0.0824	1.2136*	0.0443
Log likelihood function value	-3145.30		-3075.55	
Log likelihood function value (Restricted; $\beta=0$)	-3263.37		-3213.44	
χ^2	236.15*		275.79*	
Maddala's Pseudo R^2	0.10		0.12	

*Significant at $p \leq 0.10$.

jointly zero. Maddala's pseudo R^2 , used to evaluate the fitness of the models (Long, 1997), was 0.10 for the preference for meatless meals and 0.12 for less red meat. For cross-sectional data with categorical dependent variables, the pseudo R^2 is often small (Gujarati, 1995). Based on diagnostic tests (Belsley, Kuh, & Welsch, 1980), no collinearity problems were detected in the analyses.

Consumers' preferences for meatless meals and red meat were influenced by socioeconomic variables and nutrition concerns. For example, households living in the Northeastern and Western United States preferred more meatless meals and less red meat, compared with those living in the Midwest (table 3).

Differences between Midwestern and Southern States regarding the preference for meatless meals were not significant. The results are consistent with the livestock-related economies of the country. Large numbers of households in the Midwest depend on the livestock industry, particularly beef; this may influence preferences toward meat and red meat in general. African Americans were less likely than other racial groups (Asian Americans, Hispanics, and Latin Americans) to prefer red meat. A difference in attitude toward meat and red meat consumption associated with differences in ethnic background was reported previously in a comparative study that tested for ethnic differences in consumption of dietary fat in a community-based

Table 4. Marginal effects of the independent variables on consumer preference for meatless meals

Variables	Disagree		Neutral	Agree	
	Strongly	Somewhat		Somewhat	Strongly
Constant	0.0695	0.0217	0.0044	-0.0068	-0.0888
Northeast	-0.0330	-0.0103	-0.0021	0.0033	0.0421
South	0.0089	0.0028	0.0006	-0.0009	-0.0114
West	-0.0342	-0.0107	-0.0022	0.0034	0.0437
White	0.0048	0.0015	0.0003	-0.0005	-0.0061
African American	0.0054	0.0017	0.0003	-0.0005	-0.0069
Female	-0.0826	-0.0258	-0.0052	0.0081	0.1055
Married	0.0381	0.0119	0.0024	-0.0038	-0.0486
Households with children	0.0598	0.0186	0.0038	-0.0059	-0.0763
Some college or higher	-0.0431	-0.0134	-0.0027	0.0042	0.0550
Household income	-0.0011	-0.0003	-0.0001	0.0001	0.0014
Age	-0.0017	-0.0005	-0.0001	0.0002	0.0021
Cholesterol level in food	-0.0077	-0.0024	-0.0005	0.0008	0.0098
Amount of fat	-0.0060	-0.0019	-0.0004	0.0006	0.0077
Vitamins and minerals	-0.0056	-0.0017	-0.0004	0.0005	0.0072
Sugar	-0.0079	-0.0025	-0.0005	0.0008	0.0101

Education level of the respondents positively influenced the preferences for meatless meals and red meat: Respondents with either college or an advanced level of education preferred to have more meatless meals and less red meat than did those with less than a college education.

sample of Hispanic and White adults with low educational attainment (Winkleby, Albright, Howard-Pitney, Lin, & Fortmann, 1994). The study reported high consumption of dietary fat among Whites with low educational attainment and increased consumption of fat among Hispanics at higher levels of acculturation.

Family composition and children in the households significantly affected the households' preferences for meatless meals and red meat. Households with children were likely to be concerned about nutritional balance in the diet. For example, zinc deficiency is known to occur in children's diets that are low in sources of readily bioavailable zinc such as red meat and high in unrefined cereals that are rich in phytates and dietary fiber (Sandstead, 1991).

In the study reported here, households with children and married-couple households preferred more meals with

meat and red meat than did the households without children and unmarried-couple households, respectively (tables 3 and 4). The probability that the respondents strongly agreed that they were eating meatless meals was lower by 5 percent among married respondents than that of unmarried respondents (table 4). Similarly, the difference in the probability of respondents in households with children, compared with their counterparts, strongly agreeing that they were eating meatless meals was as high as 8 percent.

Similar results were reported in a study among Australian married-couple households with children, where groups with lower mortality rates tended to spend more money on fruits, vegetables, cereal products, and fish, compared with groups with higher rates of mortality (Powles, Hage, & Cosgrove, 1990). In addition, households with these lower mortality rates spent substantially less on alcohol and substantially more on red meat.

Household income positively influenced consumers' preferences toward more meatless meals and less red meat. Increases in household income had positive marginal effects on the probabilities for other categories such as "somewhat agree" and "strongly agree" for more meatless meals and less red meat (tables 4 and 5). That is, each \$10,000 increase in annual household income increased the probability that respondents' "strongly agreed" they were eating more meatless meals and less red meat by 1.4 and 12 percent. The marginal effect is more impressive for less red meat than it is for meatless meals.

This result agrees with findings of the 1997-98 USDA report on *Food Spending in American Households* (Blisard, 2001), which showed that during the 2-year period of 1997-98, Americans in the highest income group spent only \$91.22 per person on beef, whereas the middle-income group spent only \$94.53. During the same period, the highest income group spent \$193.73 per person for *all* meat items. By comparison, the middle-income group spent \$196 for *all* meat items.

Nayga (1996) reported that income had significant and positive effects on consumers' use of information regarding undesirable nutrition factors such as fat, calories, and cholesterol. In another study, researchers showed that among Bulgarian households, concern about fat content in food items was positively related to their income (Moon et al., 1998).

Many studies have suggested a greater health concern among women, compared with men (Frazao & Cleveland, 1994; Nayga & Capps, 1994). In our study, women respondents were not statistically different from their male counterparts about their preference for red meat, although they preferred more meatless meals (tables 3 and 4). In

Table 5. Marginal effects of the independent variables on consumer preference for less red meat

Variables	Disagree		Neutral	Agree	
	Strongly	Somewhat		Somewhat	Strongly
Constant	0.1140	0.0386	0.0177	-0.0016	-0.1687
Northeast	-0.0007	-0.0002	-0.0001	0.0000	0.0010
South	0.0433	0.0147	0.0067	-0.0006	-0.0641
West	-0.0008	-0.0003	-0.0001	0.0000	0.0012
White	-0.0556	-0.0188	-0.0087	0.0008	0.0823
African American	-0.0411	-0.0139	-0.0064	0.0006	0.0608
Female	-0.0025	-0.0008	-0.0004	0.0000	0.0037
Married	-0.0748	-0.0253	-0.0116	0.0010	0.1107
Households with children	0.0127	0.0043	0.0020	-0.0002	-0.0188
Some college or higher	-0.0610	-0.0206	-0.0095	0.0008	0.0903
Household income	-0.0808	-0.0273	-0.0126	0.0011	0.1196
Age	-0.0293	-0.0099	-0.0046	0.0004	0.0434
Cholesterol level in food	-0.0084	-0.0028	-0.0013	0.0001	0.0124
Amount of fat	-0.0064	-0.0022	-0.0010	0.0001	0.0095
Vitamins and minerals	-0.0016	-0.0005	-0.0002	0.0000	0.0023
Sugar	-0.0062	-0.0021	-0.0010	0.0001	0.0092

related studies, Lin (1995) noted that females were more likely to believe food safety was very important in food shopping; and Guthrie, Fox, Cleveland, & Welsh (1995) reported that females were more likely to use nutritional labels in making food selections.

Education level of the respondents positively influenced the preferences for meatless meals and red meat: Respondents with either college or an advanced level of education preferred to have more meatless meals and less red meat than did those with less than a college education. The marginal effects of education on the dependent variables (tables 4 and 5) show that respondents with some college or higher education were 5 and 9 percent more likely to "strongly agree" that they were eating meatless meals and less red meat, respectively, than were those without some college or higher education. Presumably, respondents with a higher education read nutrition information and connected diet-disease relation-

ships (Nayga & Capps, 1999; Putler & Frazao, 1994). Thus, public health and nutrition education can raise the nutritional awareness of consumers by targeting those segments of the population with less education.

Our findings suggest that older respondents, compared with younger respondents, preferred more meatless meals and less red meat. Positive relationships between age and general health concerns were reported in previous studies. These include concerns for food safety (Michaud et al., 2001) and using food labels for nutritional information (Nayga, 1996).

Nutrition concerns that affect selection of food items had a positive influence on consumers' preferences for meatless meals and less red meat. In this study, as the level of concern for nutrition increased, consumer preferences for meat in general and red meat in particular were likely to decrease. Concerns for cholesterol, fat, and

sugar each had a stronger effect on the preference for less red meat, compared with vitamins and minerals. The magnitude of effects on the preferences for both meatless meals and red meat was highest for cholesterol concern, followed by sugar and fat concern. Although the data used in this study showed an association between red meat and consumers' perceived concern about sugar, it is important to note that red meat does not contain sugar. It is likely that consumers' general nutritional concern regarding food may not necessarily reflect their knowledge about specific nutrient content.

Conclusion and Implications

A regression analysis was used in this study to analyze socioeconomic and nutritional factors affecting consumer preferences toward meatless meals and meals with less red meat. Consumers' preferences for meatless meals and red meat were influenced by a number of socioeconomic variables such as geographical location, racial and ethnic background, family composition, and household income. There were differences between men and women and members of different age groups and at different educational levels. Although women were not statistically different from their male counterparts regarding their preference for red meat, they generally preferred more meatless meals. Nutritional concerns among consumers—particularly for cholesterol, fat, and sugar—also played a role in consumers' preferences. These results have important implications for public health and should be considered when developing campaigns related to health promotion or meat consumption.

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